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Polarized Fermi condensates

MEERA PARISH, Princeton University

We theoretically investigate the polarized two-component Fermi gas, which is the simplest fermion system displaying both superfluidity and "magnetism". In particular, we show that the elusive Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) modulated superfluid phase may be realized by embedding the polarized Fermi gas in an array of weakly-coupled parallel 1D "tubes" produced by a two-dimensional optical lattice. We argue that the most promising regime for observing the FFLO phase is in the quasi-1D regime, where the atomic motion is largely 1D but there is weak tunneling in the transverse directions that stabilizes long range order. Moreover, within this system, there is an additional phase transition in the FFLO phase, where the quasiparticle spectrum changes from gapless near the 3D limit to gapped in the quasi-1D regime.